mation can be expected in the discharge-measurement of mighty rivers in flood. This collection of river discharge-measurements being made in such a way as to test each other is almost unique, most published results being isolated results incapable of test.

ALLAN CUNNINGHAM

OUR BOOK SHELF

The Botanical Atlas; a Guide to the Practical Study of Plants. By D. McAlpine, F.C.S. (Edinburgh: W. and A. K. Johnston, 1882.)

THE above is the title of a publication appearing in monthly parts, each containing, in the words of the prospectus, "four beautifully coloured plates and descriptive letterpress." Part I. deals with common representatives of the natural orders *Caryophyllaceæ*, *Cruciferæ*, *Fumariaceæ*, *Geraniaceæ*, and *Labiatæ*.

We are perplexed as to the intentions of the author of this work, which is advertised as designed "for the use of medical schools and Universities." If the "Botanical Atlas" is intended to supply candidates for certain elementary examinations with the facts absolutely necessary for a "pass" certificate, it seems fair to expect accuracy in the drawings of common objects.

The author, however, appears to think otherwise; not only are there gross inaccuracies in the execution of the conspicuous figures, but the types are ill-chosen and imperfectly referred to.

In illustration of this may be noted Fig. 2, on Pl. xiv., professing to represent a vertical section of the common wallflower; the reference "long stamen," points to the anther of a short one, and the words "short stamen," are referred to a green band, which might be imagined as intended for filament, petal, or sepal, and seems to do duty for all three.

In the figures standing for other vertical sections of flowers—*e.g.* Fig. 3, Pl. xvi., and Figs. 2 and 3, Pl. xxiii.—no one can avoid noticing the mysterious vagueness in the lower portions of the drawings; the same remark applies to the sections on Pl. xv. Is the author undetermined as to the relations of the parts composing the andrœcium and gynœcium, or does he expect students, for whom elaborately-coloured drawings of sepals and petals have been prepared, to discover the forms and relations of the smaller essential organs without aid—or, rather, in spite of the misleading caricatures here placed like pitfalls in his path?

Similar faults are apparent in the diagrammatic plans of the flowers, and one wonders at the ingenuity displayed in going so far out of the way to prepare imperfect and inaccurate drawings of common objects.

Among other equally ingenious misrepresentations may be named Figs. 9 and 10, Pl. xv.—the marvellous streaks in a somewhat oval frame (Fig. 11, Pl. xvi.) supposed to represent a longitudinal section of the seed of *Geranium*, the incomprehensible *stigma* in Fig. 8, Pl. xxiii., with reference to which we cannot agree with the author when he says: "The figures will show the arrangement of the parts better than any description."

Passing over such errors as Nostoe, Hydrodietyon—possibly printer's mistakes—and the questionable mixtures of Latin and English names, we may notice one or two specimens of description appended to these gaily-tinted plates. We are told, without further remark: "The form and arrangement of the different parts (Fumitory) are evidently suggestive of some purpose." Also, the description of the wallflower commences: "Wallflower is a universal favourite, no less from its beautiful colour than from its sweet smell," and then passes on to a highly condensed and imperfect synopsis. We are told that the "Campion" "also smells in the evening in order to guide and attract insects," and that in Herb Robert "the stem forks a deal, and is very brittle at the joints."

Such drawings and writing speak for themselves. We can only express the hope that if the other parts are published, more attention will be paid to accurate delineation and exhaustive description, and less to merely gaudy colouring. So far, the "Botanical Atlas" must be considered as but a very inefficient and faulty "guide to the practical study of plants."

W.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.*]

The Magnetic Storms of 1882, April

THE Astronomer Royal having received from Mr. Charles Carpmael, superintendent of the Meteorological Office at Toronto, Canada, copies of the Toronto records of the double magnetic storm of April last, has had them compared generally with the Greenwich records. Some results of this comparison I am desired by him to communicate to you for insertion, if you think proper, in the columns of NATURE.

The records comprise traces of the changes of magnetic declination, horizontal force, and vertical force. The commencement of disturbance on April 16 was sudden, in all elements, as was also the renewal of disturbance on April 19. Measuring out the times, both for Greenwich and Toronto, the following results are found:—

Element.	Toronto time of commencement of disturbance. h. m.	Corresponding Greenwich time. h. m.	Greenwich time of commencement of disturbance. h. m.
Declination ...	April 16, 6 17 ...	16, 11 35 ...	April 16, 11 31
Hor. Force ...	,, 6 15 ...	,, 11 33 ...	,, 11 31
Ver. Force ...	,, 6 16 ...	,, 11 34 ...	,, 11 35
Means		April 16, 11 34 ...	April 16, 11 32
Declination ...	April 19, 10 15 ...	19, 15 33 ...	April 19, 15 34
Hor. Force ...	,, 10 16 ...	,, 15 34 ...	,, 15 34
Ver. Force ...	,, 10 16 ...	,, 15 34 ...	,, 15 37
Means		April 19, 15 34 ...	April 19, 15 35

The times are mean solar. In the first case the mean of the Greenwich times is but 2m. earlier than that of the reduced Toronto times; in the second case 1m. later, indicating no real difference. This confirms, what has been before observed, that in times of storm the commencement of disturbance at different places appears to be simultaneous.

As regards the variations registered during the progress of the storm there does not seem to be any very close correspondence between the records of the two places excepting in one particular, the occurrence of a very remarkable decrease of horizontal force, soon after the first outbreak on April 16, which continued for some hours, and is a striking feature in both records.

WILLIAM ELLIS

Royal Observatory, Greenwich, June 16

Earthquakes in China

PLUSIEURS secousses de tremblement de terre ressenties en Chine pendant l'année 1881 ont été rapportées dans les journaux de Shanghai, de Hongkong et de l'étranger. Voici sur deux d'entr'eux quelques circonstances toutes particulières qui sont venues à ma connaissance et dont on n'a pas parlé.

Le 20 Juillet, un peu après 9h du soir, une secousse assez forte ébranla la ville de Tchong-kin, capitale de la Province de Sze-tchuen, longitude 104° E. de Paris; immédiatement après, écrit un Missionnaire, la ville fur couverte d'une brume tellement dense qu'on ne voyait pas à 10 pieds devant soi; de plus une odeur de soufre très sensible se repandit partout. On prit tout d'abord cette brume et cette odeur pour un indice d'incendie;

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mais on le chercha en vain. La terreur était d'autant plus grande dans la ville que le peuple, à cette époque même, multipliait les superstitions, et les sacrifices en l'honneur des divinités protectrices contre les incendies. Aussi le grand mandarin de Tchong-kin avait prohibé la vente et l'usage des allumettes chimiques importées par les étrangers (yang ha) et celui du pétrole (yang ieon) qui avaient naguère occasionée une terrible conflagration.

Voici une note de Mr. Harding, l'ingénieur chargé d'elever un phare à la pointe sud de l'île Formose.—Le 11 Décembre 1881, vers 4h du matin, trois chocs distincts de tremblement de terre furent ressentis." The first, of which the motion was oscillating, and which was the most severe, lasted about 3 to 4 seconds; then an interval of about 10 seconds followed by the second shock—an interval of 1 or 2 seconds, followed by the third shock—direction from S.S.W. to N.N.E. These shocks, which were of great severity, were also felt in Tai-wan-foo and Takow (environ 75 et 52 milles an nord nord-ouest du cap sud). The water at South Cape rose 16 feet, causing great destruction to the cargo boats moored near the beach, and was accompanied by a heavy southerly swell. The water which at spring tides only rises 3 feet 8 inches, had resumed its ordinary level at 7 a.m.

On March 19, 1882, at about 5 p m., a slight shock of earthquake (toujours au cap sud), with a gentle oscillating motion from south to north. Duration of shock about 3 seconds."

J'ai pensé que ces curieux faits intéresseraient les lecteurs de NATURE.

Le Directeur de l'Observatoire,
MARC DECHEVRENS, S.J.

Observatoire de Zi-ka-wei, près Shanghai, Chine, Avril 25

P.S.—Une grave perturbation magnétique a été enregistrée à Zi-ka-wei le 17 Avril dernier. Elle débuta brusquement à 7h. 36m. du matin (temps moyen de Zi-ka-wei, longitude 8h. 5m. 50s. de Gr.) par une augmentation de la composante horizontale de l'intensité et une diminution de la déclinaison. Vers 8h. un mouvement inverse commença pour se continuer avec de larges ondulations mêlées de saccades brusques et nombreuses jusqu'á 2h. 22m. de l'après midi, moment où la déclinaison atteignit son maximum. Entre le minimum, qui fut enregistré quelques minutes après le début de la perturbation, et ce maximum de 2h. 22m. la déclinaison a varié de 21'·1, valeur considérable à Zi-ka-wei. La composante horizontale eut son minimum d'intensité (apparent à cause de la variation de température) d'abord á 4h. 20m. du soir, puis encore à 7h. 20m. du soir. Ou peut se rendre compte de l'énorme baisse enregistrée en cette occasion, en sachant que le 19, par exemple, où la variation de la composante fut normale, la courbe photographiée à une amplitude totale de 15 millim, tandis que le 17 pendant la perturbation la variation totale s'éleva à 76 millim. entre 7h. 36m. du matin et 4h. 20m. du soir. Les grandes ondulations se dessinèrent pendant le minimum d'intensité entre 2h. du soir et 10h. du soir. Vers 11h. 30m. du soir la composante se releva très-brusquement, oscilla encore 3 ou 4 fois ce vers 3h. du matin 18 la perturbation était finie. A cette augmentation brusque d'intensité correspondit une diminution non moins rapide de la déclinaison, suivie aussitôt après d'une forte augmentation qui mit aussi fin à la perturbation de cette boussole.

Pendant tout ce temps l'aimant de la composante verticale oscilla constamment mais dans de très-petites limites; il n'y eut que deux ondulations qui se dessinèrent assez nettement, l'une entre 8¼ et 8½ du soir l'autre à 11.30.

Le 20 Avril, nouvelle perturbation aussi intéressante commencant avec une soudaineté et une violence extraordinaire à 11h. 40m. du matin par une énorme diminution de la composante horizontale, suivie de sauts ou d'ondulations amples et assez rapides. Inutile de dire que la déclinaison a varié proportionellement et en sens inverse. Le maximum de déclinaison fut enregistré à 3h. 43m. de l'après-midi; entre le minimum normal de 9h. et ce maximum de l'après-midi la variation à été de 13'·2 seulement. La perturbation prit fin à 2h. 20m. du matin le 21, quoique la déclinaison continuât à être irrégulière dans la journée.

A cette double perturbation magnétique ont correspondu des troubles profonds dans toutes les lignes télégraphiques, marines ou terrestes, de l'extrême Orient, de Singapore et Manille jusqu'à Tientsin. Les moments ou les courants perturbateurs furent observés furent surtout, le 17, entre 10h. et midi (Nagasaki-Shanghai Shanghai-Hongkong), à midi 50m. (Hongkong-Amoy-Shanghai), à ce moment la correspondance entre Hongkong, Manille, et Singapore entiérement interrompue; entre 2h. 5m. et 2h. 20m. Shanghai-Amoy). Le 20, à midi (Shanghai-Nagasaki).

Tout cela indique pour l'Europe de belles aurore boréales. Ici rien.

Non-Electric Incandescent Lamps

IT is I believe well known that a method of obtaining light by means of incandescent platinum was patented by A. Cruckshanks in 1839. The following extracts from his specification (No. 8141) will, I think, show that there is no essential difference between the lamp devised by Prof. Regnard (NATURE, vol. xxvi. p. 108) and the invention of the patentee, which is described as follows:—

"In order to increase the light obtained from substances that are rich in carbon and to obtain light from gases and vapours that do not contain the proportions of carbon necessary to produce a bright flame, I construct a cage of fine platina wire gauze or network of the form of the flame and just so much smaller than the flame, that it may be entirely immersed in the outer portion of it, where it will soon become intensely ignited."

Further on it is stated that the platinum (covered with lime) may be heated by jets of the "vapour of inflammable liquids mixed with atmospheric air," and the patentee says that "the most advantageous method in practice" of obtaining the mixture "is to pass a current of air through such liquid."

The use of incandescent platinum as a source of light was again patented in 1849 by Gillard, and put in practice at Narbonne and some other small towns in France, but after a fair trial the experiment was abandoned (see King's "Coal Gas," vol. i. p. 53).

F. M. SEXTON

61, Barrington Road, S.W., June 12

Conservation of Solar Energy

THE views of Dr. C. William Siemens suggest a consideration of the influence of solar rotation upon the æthereal atmosphere, at various distances from sun's centre.

Laplace's limit of equal rotary and planetary velocity is at 36·35 $r_\circ$, $r_\circ$, being sun's semidiameter. The centrifugal force of rotation at that limit would be 1321·3 times as great as at sun's surface, while the centripetal force of gravitation is only $\frac{1}{1321\cdot3}$ as great. The lately-published photographs of the solar eclipse indicate an atmospheric oblateness which may be due to the equilibrating tendencies of the two opposing forces.

If the æthereal disturbances from this source are not sufficient to account for luminous and thermal vibrations, we may look next to the velocity which the subsiding particles would acquire in falling from the equatorial limit to the solar poles. If there were no resistance, this velocity would be

$$\left(\frac{35\cdot35}{36\cdot35} \times 2gr\right)^{\frac{1}{2}} = 376\cdot8 \text{ miles per second.}$$

Any diminution of this velocity by resistance would be converted into heat.

If we apply Coulomb's formula of torsional elasticity, $f = \frac{\pi a^2 W}{2gt}$, to solar rotation, W may represent sun's mass, a the coefficient of the radius of torsion, f the coefficient of torsion, g gravitating acceleration at sun's equatorial surface, t time of oscillation when the force of torsion is removed, or time of a solar half-rotation. Then

$$f = \frac{m}{2} = \frac{W}{2} \cdot \frac{\pi^2 a^2 r_\circ}{gt^2}; \therefore \pi a^2 r_\circ = gt^2 = \pi^2 l.$$

But gt, or the projectile velocity that is represented by sun's rotary oscillation, is *the velocity of light*; gt^2 is the modulus of light at sun's equatorial surface; $a^2 r_0$ is the theoretical length of a pendulum, at sun's surface, which would oscillate once in each half rotation; $ar_\circ$ is the length of an equatorial radius rotating with sun, and having the superficial orbital velocity, $\sqrt{gr}$, at its emote extremity.

PLINY EARLE CHASE

May 27

The Function of the Ears in the Perception of Direction

UNFORTUNATELY, through the bungling of my late agents, I am unable to refer to NATURE, vol. xxiv. p. 499, as quoted by

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